Remarks by

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Administrator

National Aeronautics and Space Administration

First Anniversary

Earth Resources Technology Satellite

The Franklin Institute

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It is indeed a pleasure for me to come to Philadelphia this morning to represent the National Aeronautics and Space Administration at this birthday celebration for ERTS-1, and then to go on to Valley Forge this afternoon to meet with many of the people who helped design and build this remarkable spacecraft.

a. Birthday
b. Valley Forge later

I am delighted to be able to say, here and in Valley Forge, that the overall performance of the spacecraft and its instruments has been excellent. The quality, variety, and value of the information being returned has exceeded our expectations, and the scientists and government officials who are using this information on an experimental basis have been very pleased with the results.

Please I with Results

As previously announced, there were some early problems with an electrical power circuit and with one of the two tape recorders aboard the spacecraft, but the amount of data lost because of these problems is not significant compared with the wealth of data being obtained. In short, as viewed from NASA Headquarters, ERTS-1 has been a brilliantly successful experimental spacecraft during its first year, and I congratulate its designers and builders: The Space Division of the General Electric Company

Problems

at Valley Forge, Pa., which built the spacecraft and its special Data Collecting System, and the ground data handling station; the suppliers of the two main sets of instruments aboard the spacecraft, the Astro Electronics Division of RCA at Princeton, N. J., and the Hughes Aircraft Company of Culver City, California; the many other subcontractors and suppliers throughout the country; and the NASA management team at the Goddard Space Flight Center in Maryland.

I also want to take this opportunity to thank the principal investigators and all others, in the United States and abroad, who are studying the imagery from ERTS-1 to determine the many uses that can be made of operational earth resources satellites in the future. Incidentally, ERTS-1 data is going to 206 principal investigators in the United States and 100 principal investigators in 38 foreign countries and two international organizations. Without the enthusiastic participation of these investigators, (and many other potential users who are looking over their shoulders at the results) the brilliant technical performance of ERTS-1 would be pointless.

ERTS-1 has a design life of one year, but we are hopeful of getting months and indeed years of additional performance from it. The NIMBUS weather satellites, which are of similar design, have had an average useful lifetime of three years. ERTS-B (which will become ERTS-2 when in orbit) is now scheduled for launch in 1976. So I know that many ERTS-1 experimenters all over the world join with this audience in wishing ERTS-1 many happy returns of the day!

We are here today to do much more than celebrate the fact that ERTS-1 was well built and has functioned successfully for a year. We are here, as I see it, to stress our conviction that ERTS-1 has proved itself to be one of the most important and most promising satellites of the Space Age.

With ERTS-1 we have developed and demonstrated a whole new science and technology for making useful earth observations from space. We have produced a valuable new space-age tool to help mankind solve global problems on a global scale. And it is fortunate that we have produced this new tool at a time when the need for it is strongly felt. We are here today to say to the world that, three years after the first men stepped upon the Moon, we have taken another giant stride for mankind -- here at home, in Near Earth Orbit. It is a step forward without high drama, but with the highest significance. With ERTS-1 we have taken a step that will help save the world as a habitable home for mankind.

What makes ERTS-1 such a potent new tool?

Very simply stated, ERTS-1 represents three major breakthroughs:

First, the new instruments that produce what we call spectral images rather than photographs.

Second, the fact that these spectral images can be analyzed at high speed by computers to give each of many different users the relevant information he seeks. Ordinary photographs cannot be processed by computer in the same effective way.

Three, the spacecraft technology that can maintain the new instruments in a sun synchronous polar orbit necessary for broad views and repetitive views of the entire globe under the best lighting conditions and at reasonable cost.

We have combined these three breakthroughs -- and many other scientific and technological advances -- into one experimental system called ERTS, and it works. That's what we are celebrating here today.

Right now, a fourth breakthrough is in the making. Thousands of potential users around the world are studying ERTS data and ERTS concepts and learning how to interpret and use the new spectral imagery rather than the familiar geometrical shapes of ordinary photography. And as they learn, they are constantly identifying new ways that spectral imagery from ERTS can be used in their special field of interest.

Just as every human being has finger prints that are unique, every thing that appears in the ERTS images has its own spectral signature. Thus, a field of corn looks slightly different in ERTS imagery than a field of wheat. And a healthy field of corn looks different from one that is affected with corn blight. As we learn to distinguish the various spectral signatures of all the things we want to identify in ERTS imagery, we can teach a computer to do the same. That's earth observation ERTS style, space age style.

ERTS-1 provides the broad view because it operates at an altitude of about 570 miles and each image it produces covers an area 115 miles square. Thus several images can cover a whole metropolitan area, or a range of mountains, or a river basin. Less than 500 ERTS images are needed to cover the entire United States, compared with about 500,000 aerial photographs from high altitude.

ERTS-1 provides these images quickly and repetitively. It covers the entire globe (except for small areas near the poles) every 18 days, and then begins again. And another very important feature is that these repetitive images are always taken at the same time of day local time.

The sun-synchronous polar orbit used by ERTS and other applications satellites never ceases to amaze me. ERTS-1 completes a revolution of the Earth every 103 minutes and 18 seconds. Although it crosses the equator from north to south 14 times a day, it is always 9:30 a.m. local time (sun time) where it crosses. ERTS-1 crosses the Philadelphia area at 10:01 a.m. Eastern Standard Time every 18 days. It will pass over Philadelphia tomorrow.

This uniform timing is important. The light and shadows at this time of day are best for image interpretation. And the fact that the lighting is essentially the same in all the thousands of images recorded around the globe makes it much easier to put them together to form large maps or to make comparisons over the months and years. ERTS images have another advantage over photos or images made from aircraft. There is little or no distortion at the edges. Every feature appears as if it were right under the spacecraft lens. This saves mapmakers much time and trouble and will help improve the accuracy of the world's maps.

It will also be possible, as computer techniques for analysis of ERTS images are refined, to give a particular user only the subject matter he needs. A specialist studying the world's rice crops might get computer

printed maps showing only rice fields. A land use planner would get quite different information. And so on. So the name of the game in earth observation today is not only to get a tremendous amount of repetitive information, but to get the relevant portions of it to the people who need it when they need it. That is what the user agencies, such as the Department of the Interior and the Department of Agriculture, are gearing up to do.

Computer reads out what user need,

The success of ERTS-1 has still broader significance. This productive little spacecraft confirms, in my opinion, the wisdom of our national decision to come home from the Moon in this decade, and to concentrate on getting practical benefits from the use of Near Earth Space. Even though ERTS-1 is an experimental spacecraft, and not operational, it is doing an excellent job of demonstrating the present and potential benefits of working in space.

Because ERTS-1 is clearly demonstrating these benefits, it is underlining the need to push the development of the Space Shuttle in this decade, so this new space transportation system will be available to launch and service the operational versions of ERTS and other advanced spacecraft that we will want to build and use in the 1980s and 90s. Spacecraft like ERTS-1, marvelous as they are, cannot begin to attain their full potential until we decrease the cost of building and flying them. And that is exactly what the Space Shuttle will do.

For several years we have been discussing and debating what the shape and scope of our national space program should be after Apollo. The success of ERTS-1, like the success of Skylab, helps blow the whistle on that debate; it helps us to focus our aims and get on with our programs. And they most certainly must include the Space Shuttle. If ERTS-1 has any one message that comes through clearer than the rest, it is this: Build the Shuttle and intensify the practical uses of Near Earth Space.

I also believe that ERTS-1 is having a profound effect on the thinking of the world, on our approach to the emerging problems of protecting our environment and maintaining and enhancing the quality of life for all earth's peoples. Specificially, we are beginning to take a broader view of what we mean by earth resources. If you take the old narrow definition, which in my mind meant farm land and minerals, then ERTS-1 was misnamed. But I think it is time for us to change our definition of what earth resources are, and to include the things we once took for granted, at least in this country, like clean air and water; and we have to realize that land itself, not just rich farm land but any land, is a limited resource whose uses must be carefully planned if we are to continue to enjoy the good life on planet Earth. Like other spacecraft, ERTS-1 is playing a major role not only in defining the global problems facing mankind, but in helping to solve them, or at least hold them to manageable proportion.

And one final point. ERTS-1 is a striking example of the power space technology and space opportunities have to encourage the peoples of the world to work together. It is the policy of our government, and I am sure it reflects the wishes of our people, that the valuable information gathered in the ERTS program will be available to everybody. We invite all peoples to study the potential uses of this remarkable new space age tool above us and prepare to share its benefits. That is a statement I am pleased and proud to make, here in the City of Brotherly Love.

ORIGINAL

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Goddard Space Flight Center

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Interview

of

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ERTS 1ST ANNUAL PRESS CONFERENCE
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P R O C E E D I N G S

DR. FLETCHER: Well, good morning. It is a pleasure for me to be here on this historic occasion, the first anniversary of the launch of the ERTS I Satellite.

It is our purpose here in Philadelphia to first have this conference and then later go to Valley Forge, which is the part of G. E. that is responsible for the Spacecraft and for the very sophisticated data processing system which ERTS uses.

Needless to say, we wouldn't be having this anniversary get-together if we weren't very pleased with the results of the ERTS Satellite.

ERTS has much more than realized our fondest expectations, in fact, we have a number of problems with ERTS and most of which are with the fact that people regard ERTS as the operational system, whereas in fact, it is only --was only designed to be an experimental system, and yet it is already being used for our operational -- in many operational ways.

I should mention that we got off to a little bit of a shakey start in the fact that one of the tape recorders failed right off. But having anticipated problems very well with tape recorders, General Electric Company and the Goddard Spaceflight Center, in their wisdom, had two such installed and the second one is still working.

The Spacecraft, as you know, probably was designed

to last only twelve months, and we have actually arrived at that point today. We expect, however, that it will go on for another period of time, and we're taking bets as to how long that will be.

The Nimbus Spacecraft is also designed and built by General Electric Company; some of those are two and three years old. So we're hopeful that the ERTS will last for a long time.

I should mention at this time, that two other contractors who are probably not present today, also participated in this program, the Princeton Division of RCA, and the Hughes Aircraft of Culver City, both of whom made instruments that are contained in the spacecraft.

Just to give you a feeling for the scope of the program, there are over 200 investigators, I should say, principal investigators, we call them PI's, in the United States, are going over the ERTS data and another hundred spread out throughout the world in 38 foreign countries.

One of which is represented here today, Brazil, which has been extremely active, and I won't take any of his remarks away by simply mentioning that Brazil has a very active and forward-looking remote sensing program.

We in a way passed another historic milestone here today. Within less than two weeks, I guess it's almost a week of the anniversary of the landing of men on the moon,

we are celebrating the first anniversary of the ERTS Spacecraft, and as Lee Armstrong said, "We have taken another giant stride for mankind," when he arrived on the moon.

Here today, we are taking a second giant stride for mankind in the notion of using space and what it can do. Space technology for solving problems here on earth.

Now I'm not going into detail about all the problems that we are in the process of solving, but maybe give you a once over lightly feeling for why ERTS is something special and why it's different and why it's unique.

ERTS has three principal features which are different from anything else that NASA has done. The first feature is that we are using spectral images, different colors, if you like, in the case of ERTS, four different colors to determine signatures of whatever is directly below the ERTS Spacecraft on earth.

Now, these four channels of ERTS are not simply color channels; they're very definite spectral bands and so most of the photographs that you will see from ERTS since two of these spectral bands are in the infrared are not true color. Two of the bands are in infrared and the other two being green and red indivisible. So that's the first thing that's different from anything we've done before.

Of course, in the (EREP) Program, we used 13 channels but it's too early to say what the effect of the extra channels

will be.

Second important aspect of ERTS is that the whole picture is transmitted to earth electronically and placed on a computer. And so without loss of resolution, which is approximately 100 meters on the ground, directly below, we can directly process the data from these images. So the data doesn't have to be extracted from photos, it is already there in the computer and we can manipulate the data in any way we wish without losing resolution and without losing gray level. And we have 64 different gray levels, which is a pretty precision type photograph that works very well.

The third aspect is something that we have used in NASA before and that is the idea of a sun synchronous orbit which gives you the same image when it appears over the same place on earth with the same sun angle. So every day it crosses the equator, I think it's 18 times, at exactly 9:30 a.m. So the sun angle is the same except -- at the equator -- except for small changes, of course, due to the season.

But this same sun angle gives us remarkable repetitive photographs so we can observe changes from one pass to another.

Now, those are the three main things that are unique about the ERTS. We have another one in the process, which is a broad aspect, and that is, the idea of signatures; just what things on earth give what kind of signatures. And this

is in the process now, and this is what the 300 and some odd investigators are involved in. And you will undoubtedly hear more about that later.

Without going much further into the technical aspects of it, simply say that one of the interesting outcomes of this whole program has been the increased sensitivity in the world, not just the U.S., of the precious resource which we call land. We set it up as an earth resource technology satellite, thinking perhaps of forestry and agriculture and minerals. But we now see that the earth is finite and we do have to conserve the surface of the earth for man's best use.

And land itself and how it's used is a precious resource. And we will simply have this as a goal throughout the entire earth resources and remote sensing program.

This ERTS I, I believe, has had a profound effect on the thinking of the world, particularly on our approach to the emerging problems of protecting our environment and maintaining the quality of life for all of earth's people.

I think it means that we do have to be sensitive to how we use these precious resources; not just clean air and water, but clean land. And not just farmland, but any land that we are sensitive to.

And I might say in the following program afterwards, ocean is going to be also a precious resource, which we must

conserve. And there will be a little of that perhaps later on in this discussion this morning.

One last point, which I'm sure you're all aware of, but it doesn't hurt to restate it, and that is, the ERTS Program has been a striking example of the power that space technology and space opportunities have to encourage people of the world to work together.

Thirty-eight countries is a large number of countries to be involved in one program. And it's the policy of our Government to make the valuable information that is being collected from the ERTS Program available to everyone in the entire world.

We invite all peoples to study the potential uses of this remarkable space-age tool, which we will use in space and we invite them all to share in its benefits.

Thank you.

(Applause.)

C E R T I F I C A T E

I hereby certify that the tape recording represented by the foregoing pages was transcribed by me, or under my direction; that this transcript is a true and accurate record to the best of my ability.

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